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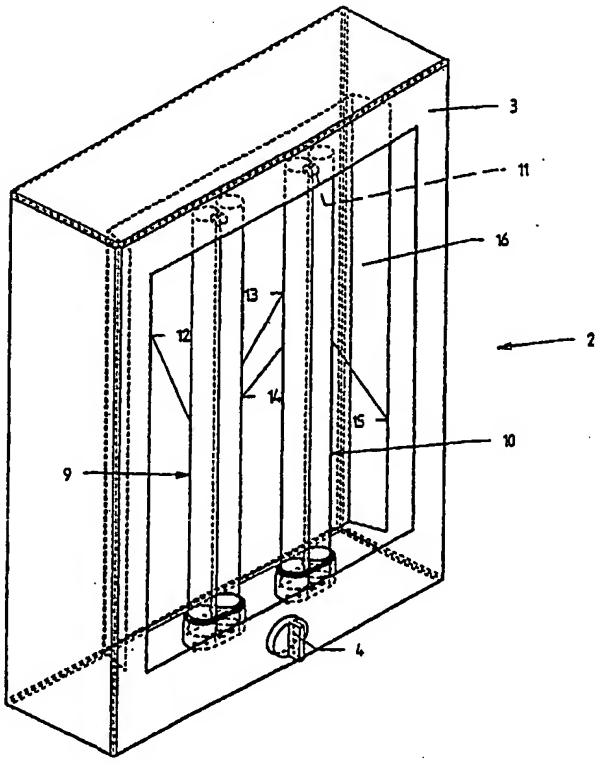
(54) Title: PROCESS AND APPARATUS FOR THE COSMETIC TREATMENT OF ACNE VULGARIS

(57) Abstract

In a process for the cosmetic treatment of acne vulgans by irradiation of the affected skin areas with light two emission spectra are used, one in the blue region (A) from 400 to 450 nm, the other in the red region (B) from 580 to 659 nm. The resulting spectrum is adapted to the action spectrum for the inactivation of the propionibacterium acne. It has a biostimulating effect on the skin cells.



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PROCESS AND APPARATUS FOR THE COSMETIC TREATMENT OF ACNE VULGARIS

This invention discloses a process for the cosmetic treatment of acne vulgaris by irradiation of the affected skin areas with light and an apparatus for the application of the process.

A known process uses UV light for the irradiation of the face. This, however, has the possible disadvantage of erythema formation or an undesirable oxidation of skin pigments.

Also known is a treatment with a cream containing approximately 0,5 % benzoyl peroxide. The disadvantage of this treatment is possible skin dryness.

It is an object of the present invention to provide a process and an apparatus for the treatment of acne which not only eliminates the known disadvantages but also results in an excellent cosmetic effect.

This task is accomplished in accordance with the invention by applying light from low pressure mercury discharge (fluorescent) lamps having two different spectra, one in the blue range from 400 to 450 nm, the other in the red range from 580 to 659 nm.

Irradiation in accordance with the invention does not result in UV damage to the skin nor in significant skin dryness.

Both partial spectra in accordance with the invention are additive. The resulting spectrum is adapted to the action spectrum for the inactivation of the propionibacterium acne. It has a biostimulating effect on the skin cells. This is caused by the fact that propionibacterium acne produces porphyrins which may be excited by short wavelength light. This has a lethal effect on the bacteria.

Light exposure studies were conducted with 61 patients having mild to moderate acne. They were treated with blue-red light in accordance with the invention and with blue light. The results were compared with white light exposure and treatment with benzoyl peroxide cream.

Patients were instructed to use the lamps for 15 minutes each day or apply the benzoyl peroxide cream twice daily.

Patient assessment was conducted every four weeks. The results are shown in the following table:

Observation	Blue / Red Light		Blue Light		White Light		Cream	
	Doctor %	Patient %	Doctor %	Patient %	Doctor %	Patient %	Doctor %	Patient %
worse/ unchanged	27	27	25	50	46	46	19	19
slight/moderate improvement	18	27	42	33	46	46	44	50
significant improvement	55	46	33	17	8	8	37	31

The number listed under "doctor" refers to a doctor's assessment, the number in the "patient" column is the patient's assessment after blue light or cream treatment.

Results show that the best results were obtained with mixed blue / red light in accordance with the invention with an average reduction of 66 % in inflammatory and 42 % in non-inflammatory lesions. With blue light the reduction was 50 % and 32 %, with white light 21 % and 0 % and with benzoyl peroxide cream 61 % and 58 %, respectively.

Investigators assessment showed a significant improvement, 55 % with blue / red light, 33 % with blue light, 21 % with white light and 37 % with cream treatment.

Patients assessment showed a significant improvement of 46 % with blue / red light, 16 % with blue light, 8 % with white light and 31 % after cream treatment. After light exposure dryness was negligible.

Fig. 1
shows the spectral energy distribution of a blue lamp,

Fig. 2
that of a red lamp according to the invention, and

Fig. 3
shows the action spectrum of the inactivation of propionibacterium acnes.

Fig. 4
shows an apparatus for the treatment of acne vulgaris, consisting of a rectangular housing 1, a time switch 4 and double-ended fluorescent lamps 5, 6, 7, 8.

Fig. 5
shows another embodiment of the apparatus shown in Fig. 4 with housing 2, timer switch 4, and single-ended fluorescent lamps 9, 10.

The apparatus as shown in Fig. 4 is provided with at least one blue and red lamp, each having a spectrum in accordance with Figs. 1 or 2, respectively. The lamps are of the double-ended low pressure mercury discharge (fluorescent) type, according to IEC Publication 60081. The embodiment in Fig. 4 shows four lamps 5, 6, 7, 8, arranged in parallel, having a bulb diameter of 15 to 40 mm and a length of 300 to 600 mm. Two of the lamps emit in the blue range, the other two in the red part of the spectrum. The arrangement of the lamps in the apparatus 1 is such that blue and red lamps alternate. In Fig. 4, lamps 5 and 7 have blue, lamps 6 and 8 red emission.

The embodiment of the apparatus in Fig. 5 shows two single-ended fluorescent lamps 9, 10, according to IEC Publicaton 60901. Each lamp consists of two legs 12, 13 and 14, 15, which are joined together by means of a hollow glass tube 11 located opposite the base end, or by a U-bent tube sealed to both legs at the end opposite the base. The total length of each lamp is between 225 to 414 mm, one leg of each lamp is coated with blue, the other leg with red phosphor in accordance with the invention.

To increase the irradiation efficiency, an external reflector is provided between each lamp and the housing 1, 2 such that the light is preferentially emitted in the forward direction. Alternatively, two or more lamps are provided with a common reflector. Still another alternative is to apply the reflector as a reflective coating onto the inner bulb wall of a lamp between the glass and phosphor coating as internal reflector.

Penetration depth of red light into the skin increases as from 600 nm up, depending also on the type of skin. Further, red light of longer wave lengths has a healing effect. To accommodate for this, variation of the intensity ratio of red to blue light can be advisable. Such accommodation in accordance with the invention can be effected by use of combinations of one blue with three red or one red with three blue lamps alternatively.

Each lamp can be operated on a dimmable ballast which allows for adjustment of the light intensity from 10 to 100 % of the nominal value.

Blue light and also red light in the 615 to 655 nm region have been found to have a killing effect on propionibacterium acne within certain exposure times and red/blue intensity ratios.

Claims

1.

Process for the cosmetic treatment of acne vulgaris by irradiation of the affected skin areas with light **characterized** by two emission spectra, one in the blue region (A) from 400 to 450 nm, the other in the red region (B) from 580 to 659 nm.

2.

Process according to claim 1, **characterized** in that the red region (B) is from 580 to 630 nm.

3.

Process according to claim 1, **characterized** in that that the red region (B) is from 630 nm to 658 nm.

4.

Process as defined in claim 1, 2 or 3 wherein the irradiation is conducted once per day for about 15 minutes.

5.

Apparatus for the application of the process in accordance with at least one of the preceding claims by means of a fixture (1, 2) having a housing (3) and dimmable ballast for each lamp, in which housing at least one lamp (5, 6, 7, 8, 9, 10) and at least one external reflector (16) between lamp and housing are arranged, and a timer clock for the limitation of exposure time.

6.

Apparatus according to claim 5, having four double-ended low pressure mercury vapor (fluorescent) lamps (5, 6, 7, 8) which are arranged essentially in parallel to each other, with a bulb diameter of 15 to 40 mm and a length of 300 to 600 mm of which two (5, 7) emit in the blue region and two (5, 8) in the red region.

7.

Apparatus according to claim 5 or 6, wherein the lamps are arranged such that blue (5, 7) and red (6, 8) lamps alternate.

8.

Apparatus according to claim 5 or 6 wherein one blue and three red emitting lamps are arranged.

9.

Apparatus according to claim 5 or 6 wherein one red and three blue emitting lamps are arranged.

10.

Apparatus according to claim 5 incorporating two single-ended low pressure mercury vapor (fluorescent) lamps according to IEC Pbulication 60901, having two legs which are joined together by means of a hollow glass tube (11) or by a U-bent tube sealed to both legs of each lamp, having a length of 225 to 414 mm.

11.

Apparatus according to claim 10, wherein one leg of each lamp emits in the blue region and the other leg in the red region of the spectrum.

12.

Apparatus according to claim 10 incorporating one lamp having two blue emitting legs and one lamp having a blue and a red emitting leg.

13.

Apparatus according to claim 10 incorporating one lamp having two red emitting legs and one lamp having a blue and a red emitting leg.

14.

Apparatus according to claim 6 and 7, wherein the reflector is applied as internal reflective coating onto the inner bulb wall of each lamp (5, 6, 7, 8, 9, 10).

Fig. 1

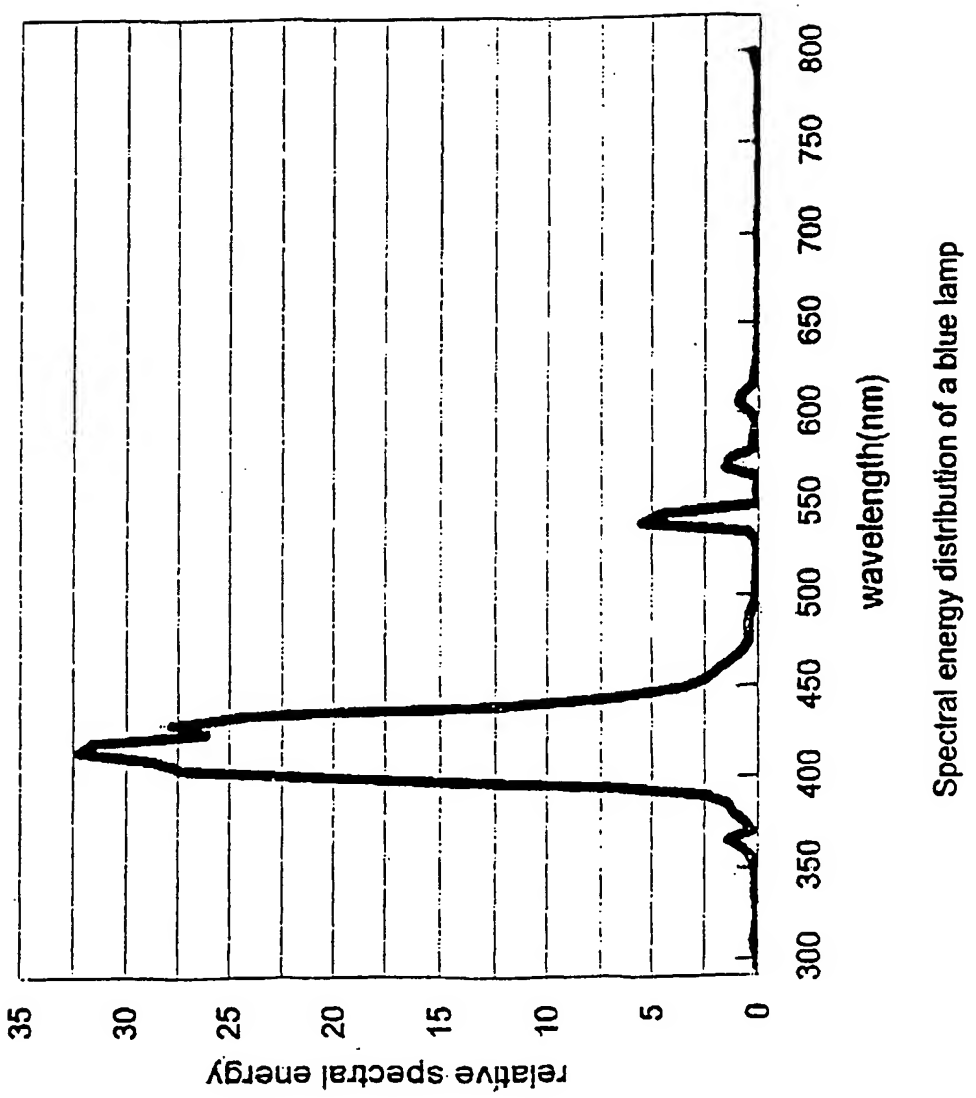
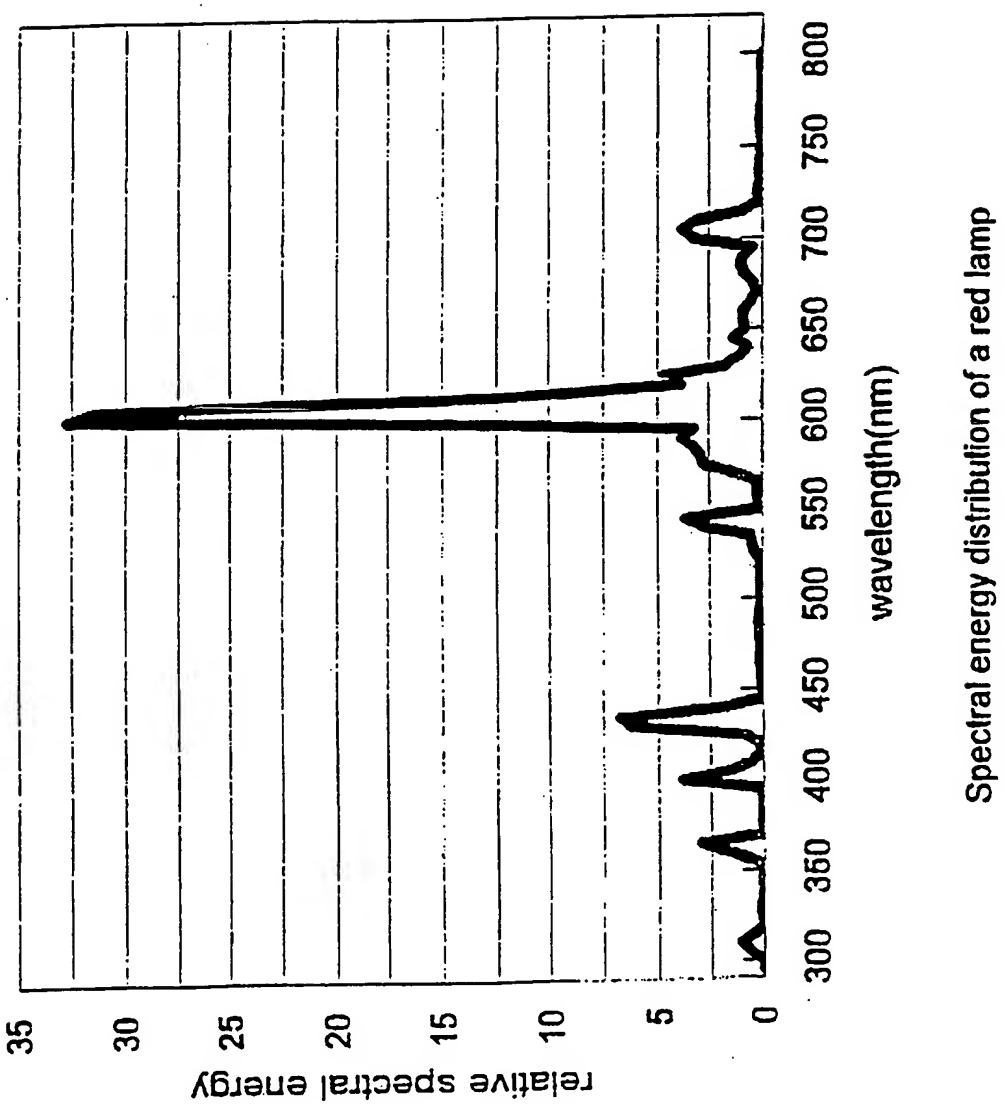

relative spectral energy
0
5
10
15
20
25
30
35
300
350
400
450
500
550
600
650
700
750
800
wavelength(nm)
Spectral energy distribution of a blue lamp

Fig. 2


relative spectral energy
0
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wavelength(nm)
Spectral energy distribution of a red lamp

Fig. 3

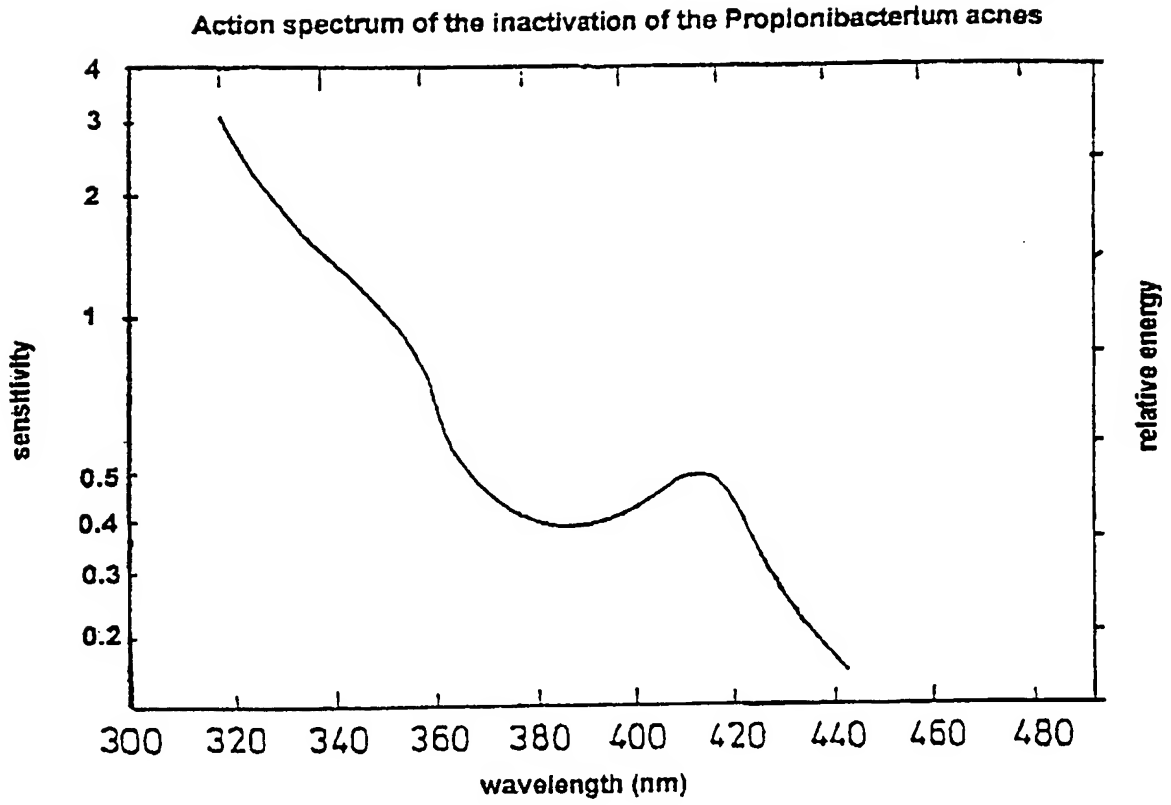

Action spectrum of the inactivation of the Propionibacterium acnes
sensitivity
relative energy
4
3
2
1
0.5
0.4
0.3
0.2
300
320
340
360
380
400
420
440
460
480
wavelength (nm)

Fig. 4

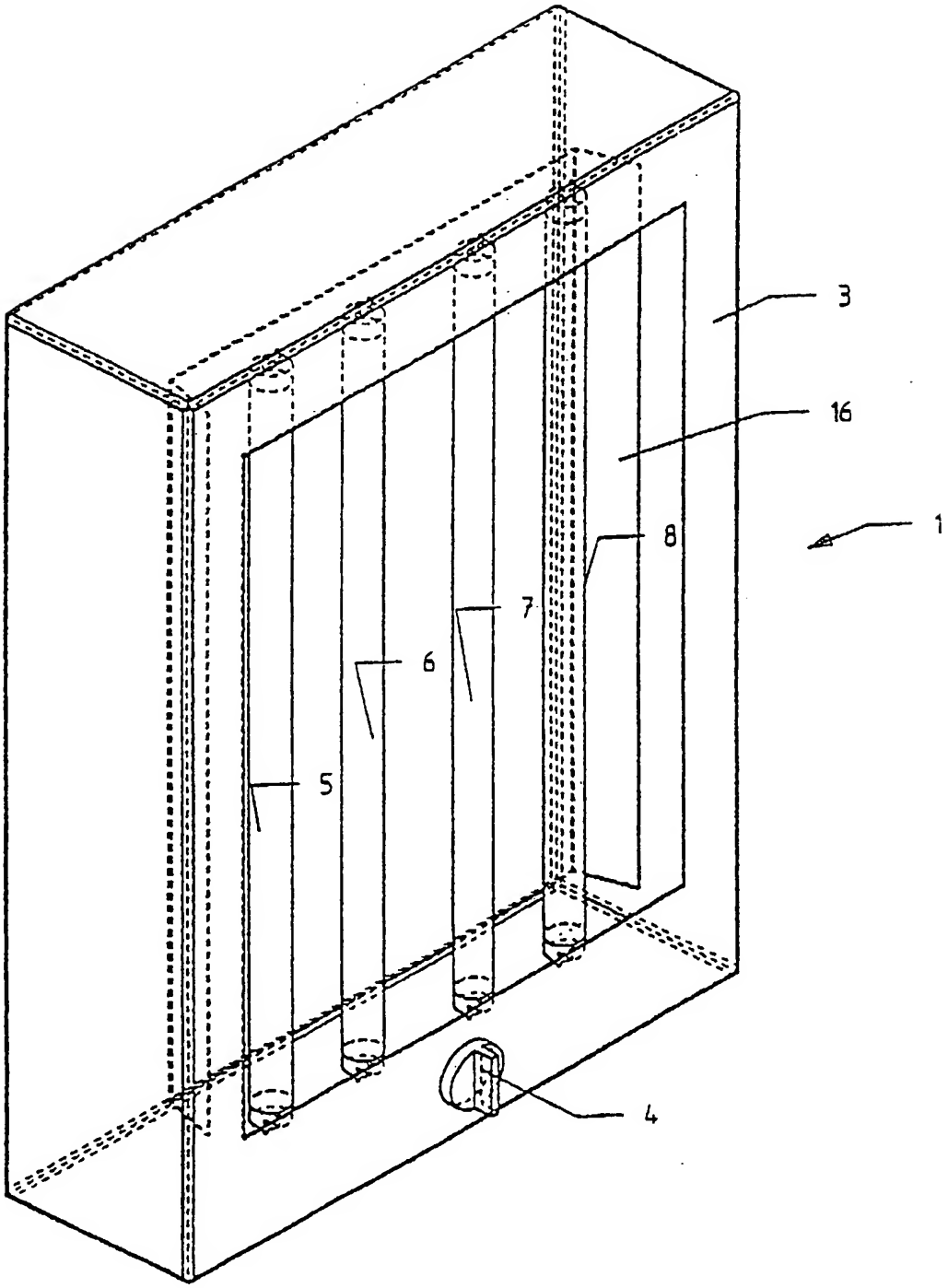
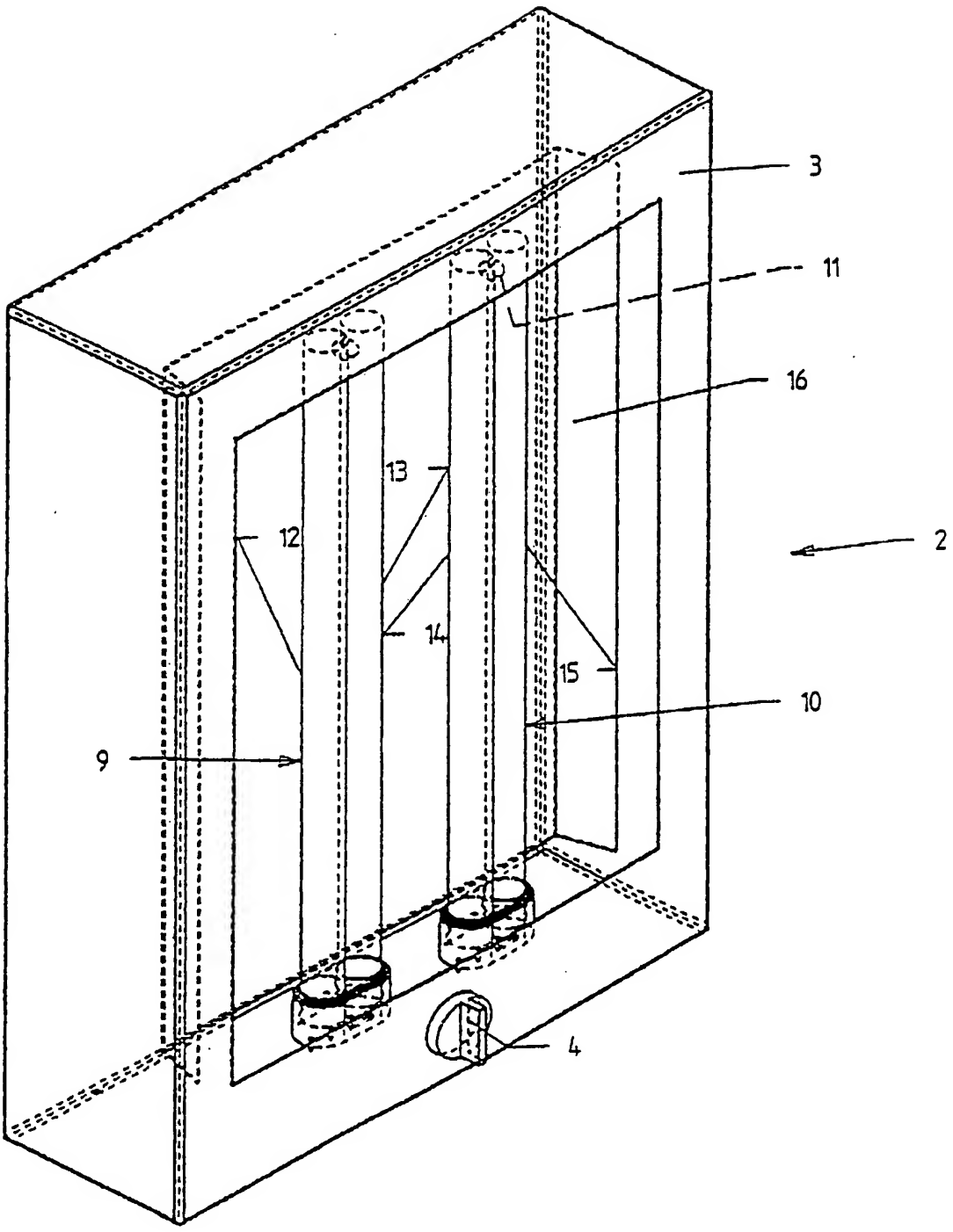


Fig. 5



INTERNATIONAL SEARCH REPORT

In ational Application No
PCT/EP 98/07884

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61N5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 14899 A (OPTOMED OPTO MED SYS GMBH ;WILKENS JAN (DE)) 23 May 1996 (1996-05-23) page 8, line 8 page 9, line 19 - page 10, line 4 page 12, line 1 - line 25 page 17, line 14 - line 31 claims 1-4,12	5,7,14
Y	---	7-9
Y	DE 40 26 327 A (GOLF GMBH & CO KG) 27 February 1992 (1992-02-27) column 2, line 40 - line 48 column 4, line 5 - line 19 --- -/--	7-9

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
20 July 1999	27/07/1999

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

In. .ational Application No
PCT/EP 98/07884

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	DE 41 43 168 A (REHA TEC VERTRIEBSGES FUER MED) 1 July 1993 (1993-07-01) column 1, line 26 - line 29 column 1, line 63 - column 2, line 4 column 2, line 25 - line 35	5
A	GB 2 190 994 A (PHILIPS NV) 2 December 1987 (1987-12-02) page 2, line 7 - line 24	5,6,10
E	DE 197 24 299 A (SLI LICHTSYSTEME GMBH) 10 December 1998 (1998-12-10) the whole document	5-14

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 98/07884

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [X] Claims Nos.: 1-4
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy.

2. [ ] Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

In ational Application No
PCT/EP 98/07884

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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